Temporal Characteristics of Oropharyngeal Swallowing in Multiple System Atrophy: A Longitudinal Study

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INTRODUCTION

Multiple System Atrophy

- Multiple System Atrophy (MSA) is a neurodegenerative disorder characterized by any combination of Parkinsonian, autonomic, or cerebellar signs.
- There are three types of MSA: Parkinson's, Cerebellar, and Ataxic.
- MSA-Parkinson's type includes bilateral involvement, bradykinesia, impaired writing, slurred speech, and rigidity.

Swallowing Characteristics

- Dysphagia is a swallowing disorder caused by bradykinesia and rigidity affecting motor function of the tongue which causes a swallowing dysfunction in the oral phase.
- Muscular weakness is a major clinical feature of multiple system atrophy.
- Oral-related symptoms such as drooling, sensory changes in the oral cavity, difficulty in chewing, and dry mouth are present in MSA-P.

PURPOSE OF STUDY

- The purpose of the study is to determine temporal characteristics of swallowing in a patient diagnosed with Multiple System Atrophy-Parkinson's.

METHODS

Subject

- Patient is 60 years old diagnosed MSA- P onset 2009
- Orthostatic normal

Videofluoroscopic Swallow Evaluation Procedure

- Evaluation 1: 1/21/2013
- Evaluation 2: 4/29/2013
- Evaluation 3: 7/8/2013
- Evaluation 4: 9/30/2013
- Evaluation 5: 12/23/2013
- Evaluation 6: 6/16/2014

Types of Bolus and Volumes

- 2mL Thin Liquid
- 5mL Thin Liquid
- Thick Liquid
- Puree
- Pudding

Temporal Measurements

Oral transit time (OTT)

- Onset of posterior movement of bolus head and passing of ramus of mandible

Pharyngeal transit time (PTT)

- Bolus head passing ramus of mandible, and tail of bolus passing the UES

Duration of UES Opening (DUESO)

- Measure from the start of the UES opening until the UES closes as bolus tail flows through

Stage Transition Duration (STD)

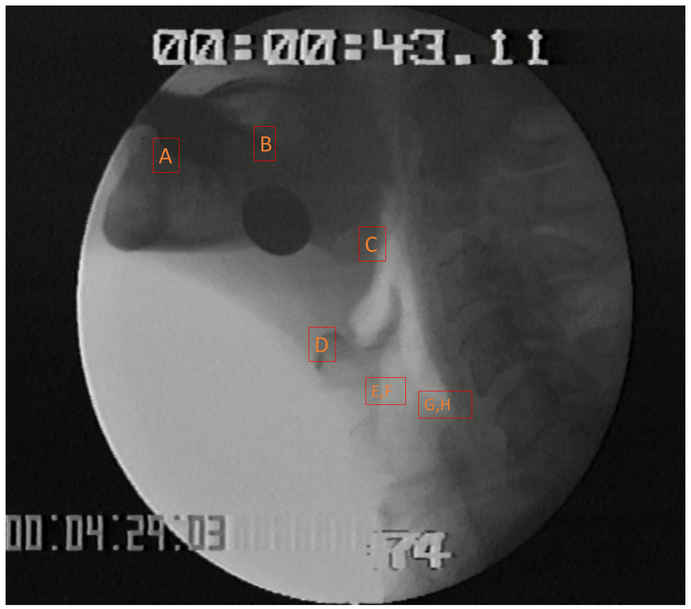
- Bolus reaches ramus of mandible while initiation of maximal hyoid excursion occurs

Initiation of Laryngeal Closure (ILC)

- Time between bolus reaches ramus and first contact of the arytenoids and epiglottis

Laryngeal Closure Duration (LCD)

- Duration of arytenoid cartilages to the base of epiglottis, first and last contact of arytenoids and epiglottis



A. Bolus appearance in oral cavity
B. Bolus onset of posterior movement
C. Bolus head passes the ramus of mandible
D. Initiation of maximal excursion of hyoid
E. First contact of arytenoids and epiglottis
F. Final contact of arytenoid and epiglottis
G. Initial opening of Upper Esophageal Sphincter (UES)
H. Tail of bolus passing the Upper Esophageal Sphincter (UES)

- This study was approved by Institutional Review Board (IRB)

RESULTS

Oral Transit Time (OTT)	1/21/2013	4/29/2013	7/8/2013	9/30/2013	12/23/2013	6/16/2014
2mL Thin	0.559	2.8565	2.6155	1.731	1.802	0.165
5mL Thin	0.5050	0.264	0.637	0.2805	0.39	0.39
Thick Liquid	0.4455	1.16	2.3135	0.196	1.132	0.0825
Puree	0.6205	2.901	1.2525	0.916	1.368	1.231
Pudding	0.165	2.83	0.4785	0.599	0.165	0.165
Normal OTT: 0.50 sec						

Pharyngeal Transit Time (PTT)	1/21/2013	4/29/2013	7/8/2013	9/30/2013	12/23/2013	6/16/2014
2mL Thin	0.7853	1.0445	0.967	0.667	0.7805	0.5495
5mL Thin	0.868	0.901	0.792	0.7195	0.967	0.604
Thick Liquid	0.637	1.137	0.917	N/A	1.17	0.604
Puree	1.1865	1.9785	1.363	0.635	0.835	0.566
Pudding	0.566	1.5975	1.363	0.6865	0.6205	0.5115
Normal: 0.80 sec						

Duration of UES Opening (DUESO)	1/21/2013	4/29/2013	7/8/2013	9/30/2013	12/23/2013	6/16/2014
2mL Thin	0.4983	0.3465	0.5015	0.408	0.67	0.368
5mL Thin	0.66	0.472	0.66	0.5625	0.472	0.4125
Thick Liquid	0.485	0.434	0.4835	N/A	0.419	0.373
Puree	0.4885	0.566	0.4455	0.363	0.335	0.335
Pudding	0.3515	0.566	0.2855	0.3515	0.3845	0.3465
Normal DUESO: 0.45 sec						

Stage Transition Duration (STD)	1/21/2013	4/29/2013	7/8/2013	9/30/2013	12/23/2013	6/16/2014
2mL Thin	0.188	0.5	0.297	0.066	0.231	0.033
5mL Thin	0.165	0.2970	0.099	0.0825	0.363	0.0875
Thick Liquid	0.066	0.6155	0.302	N/A	0.6155	0.0495
Puree	0.6485	1.5	0.9205	0.084	0.3135	0.066
Pudding	0.033	1.0825	0.033	0.0495	0.0825	0
Normal STD: 0.19 sec						

Initiation of Laryngeal Closure (ILC)	1/21/2013	4/29/2013	7/8/2013	9/30/2013	12/23/2013	6/16/2014
2mL Thin	0.221	0.566	0.4835	0.2805	0.3759	0.198
5mL Thin	0.2310	0.429	0.099	0.274	0.548	0.3235
Thick Liquid	0.099	0.67	0.368	N/A	0.751	0.1485
Puree	0.6485	1.599	0.8845	0.221	0.449	0.1815
Pudding	0.165	1.203	0.2195	0.269	0.3565	0.132
Normal ILC: 0.19 sec						

Laryngeal Closure Duration (LCD)	1/21/2013	4/29/2013	7/8/2013	9/30/2013	12/23/2013	6/16/2014
2mL Thin	1.044	1	1.3845	1.132	1.086	1.033
5mL Thin	1	1	1.967	1.198	0.9305	0.9175
Thick Liquid	1.0365	0.9655	1.35	N/A	1.018	1.033
Puree	0.967	0.802	1.1815	0.896	1.3035	1.099
Pudding	0.868	0.83	1.1205	1.1865	0.8465	0.9835
Normal LCD: 0.58 sec						

DISCUSSION

- The patient with MSA suffers from oropharyngeal dysphagia (swallowing disorder).
- Swallow for puree bolus in ILC and STD took longer across evaluations. This is related to risk of aspiration (choking).
- The patient with MSA needs intervention to improve oral transition and airway protection which is related to ILC and LCD.
- Bolus transition in the pharynx and response of PTT is slower in the thin liquid bolus swallow.
- Therapy and medication will help maintain function of swallow or improve swallowing disorder.
- Must follow a schedule of evaluations and look at long term proponents since MSA is a progressive disease.

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